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IS 3708-10 (1986): Methods of Test for Natural Rubber Latex, Part 10: Determination of Boric Acid [PCD 13: Rubber and Rubber Products]



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IS : 3708 ( Part 10 ) - 1986

*Indian Standard*

METHODS OF TEST FOR  
NATURAL RUBBER LATEX

PART 10 DETERMINATION OF BORIC ACID

[ NRL : 17 ]

*( First Revision )*

UDC 678.4.031 : 543 : 546.46



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**INDIAN STANDARDS INSTITUTION**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# *Indian Standard*

## METHODS OF TEST FOR NATURAL RUBBER LATEX

### PART 10 DETERMINATION OF BORIC ACID

[ NRL : 17 ]

*( First Revision )*

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# *Indian Standard*

## METHODS OF TEST FOR NATURAL RUBBER LATEX

### PART 10 DETERMINATION OF BORIC ACID

[ NRL : 17 ]

( *First Revision* )

#### 0. FOREWORD

**0.1** This Indian Standard ( Part 10 ) ( First Revision ) was adopted by the Indian Standards Institution on 14 February 1986, after the draft finalized by the Rubber Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

**0.2** Test methods for rubber latex had been originally covered in the following Indian Standards:

*For natural rubber latex*

IS : 3708 ( Part 1 )-1966\*

IS : 3708 ( Part 2 )-1968†

*For styrene-butadiene rubber latex*

IS : 4511 ( Part 1 )-1967‡

Since some of the test methods covered in these standards were common, the concerned committee had decided to unify and publish a separate series of methods of test which would be applicable to all types of latices — natural as well as synthetic. Accordingly, the following six test methods had been covered in the following different parts of IS : 9316.

IS : 9316 Methods of test for rubber latex:

Part 1-1979 Determination of surface tension

Part 2-1979 Determination of viscosity

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\*Methods of test for natural rubber latex: Part 1 Dry rubber content, sludge content, density, total alkalinity, KOH-number, mechanical stability, volatile fatty acid number, pH, total nitrogen, total copper, total iron, total manganese and total ash.

†Methods of test for natural rubber latex: Part 2 Determination of boric acid and magnesium.

‡Methods of tests for styrene-butadiene rubber ( SBR ) latices: Part 1 Determination of dry polymer, pH, density, residual styrene bound styrene and soap content.

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- Part 3-1979 Determination of coagulum content
- Part 4-1979 Determination of total solids content
- Part 5-1979 Drawing of samples
- Part 6-1982 Determination of  $pH$ .

**0.2.1** As a result of further rethinking on the subject, it has now been decided to re-designate the test methods common to natural and synthetic rubber latices as RL series; test methods for natural rubber latex as NRL series and test methods for styrene-butadiene rubber latex as SBRL series. Consequently, test methods for rubber latex have been rationalized into the following three series:

- a) IS : 9316 Unified methods of test applicable to both natural and synthetic rubber latices — RL series;
- b) IS : 3708 Methods of test applicable to natural rubber latex — NRL series; and
- c) IS : 4511 Methods of test applicable to styrene-butadiene rubber latex — SBRL series.

**0.3** The existing Indian Standards IS : 3708 ( Part 1 )-1966\*, IS : 3708 ( Part 2 )-1968†, IS : 4511 ( Part 1 )-1967‡, IS : 9316 ( Parts 1 to 5 )-1979§ and IS : 9316 ( Part 6 )-1982|| are being gradually replaced by separate standards under the above three series, designated by as NRL, SBRL, or RL series, respectively.

**0.3.1** The methods covered under NRL : 13, NRL : 14 and NRL : 15 of IS : 3708 ( Part 1 )-1966\* which are also under revision, have been proposed to be covered under the RL series in IS : 9316 ( *under revision* ).

**0.4** In order to facilitate cross-reference, it has been decided to retain in the revisions of various parts of IS : 3708, the original discrete NRL series numbers assigned to various test methods in IS : 3708 ( Part 1 )-1966\* and IS : 3708 ( Part 2 )-1968†.

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\*Methods of test for natural rubber latex: Part 1 Dry rubber content, sludge content, density, total alkalinity, KOH-number, mechanical stability, volatile fatty acid number,  $pH$ , total nitrogen, total copper, total iron, total manganese and total ash.

†Methods of test for natural rubber latex: Part 2 Determination of boric acid and magnesium.

‡Methods of tests for styrene-butadiene rubber ( SBR ) latices: Part 1 Determination of dry polymer,  $pH$ , density, residual styrene, bound styrene and soap content.

§Methods of test for rubber latex:

- Part 1 Determination of surface tension
- Part 2 Determination of viscosity
- Part 3 Determination of coagulum content
- Part 4 Determination of total solids content
- Part 5 Drawing of samples

||Methods of test for rubber latex: Part 6 Determination of  $pH$ .



**0.4.1** For proper referencing of the existing test methods and the new methods under revision, a statement showing corresponding methods is given in Appendix A.

**0.5** In preparing the above series, the need to align the test methods with the corresponding ISO Standards/DIS/DP wherever available has also been taken into account for updating the test methods. In the preparation of this standard, assistance has been derived from ISO 1802-1974 'Natural rubber latex — Determination of boric acid', issued by the International Organization for Standardization ( ISO ).

**0.6** In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960\*.

## 1. SCOPE

**1.1** This standard ( Part 10 ) prescribes method for the determination of boric acid in natural rubber latex which contains preservative agents and which has been subjected to some type of concentration process.

**1.2** This procedure is not necessarily suitable for latices from natural sources other than *Hevea brasiliensis* or for latices of synthetic rubber, compounded latex, vulcanized latex or artificial dispersions of rubber.

## 2. OUTLINE OF THE METHOD

**2.1** The pH of a quantity of latex containing about 0.02 g of boric acid is adjusted to 7.5 at which value boric acid exists substantially in the undissociated form. Mannitol [  $C_6H_8(OH)_6$  ] is then added in excess to form the strongly acidic boric acid — mannitol complex. Hydrogen ions equivalent to boric acid present in the latex are thus liberated and the pH falls. Boric acid is determined from the amount of alkali required to restore the pH of the latex to 7.5.

## 3. APPARATUS

**3.1 pH Meter** — equipped with glass electrode and saturated calomel cell and capable of being read to 0.02 unit.

## 4. REAGENTS

**4.1 Sodium Hydroxide Solution** — approximately 0.05 N.

**4.2 Dilute Hydrochloric Acid** — 2 percent solution (v/v) ( see IS : 265-1976† ).

\*Rules for rounding off numerical values ( revised ).

†Specification for hydrochloric acid ( second revision ).

**4.3 Stabilizer Solution** — 5 percent aqueous solution (*m/v*). A non-ionic stabilizer of the ethylene oxide condensate type.

**4.4 Mannitol**

**4.5 Boric Acid** — 0.5 percent aqueous solution (*m/v*).

## 5. PROCEDURE

**5.1 Standardization of Sodium Hydroxide Solution** — Pipette 5 ml of boric acid solution into a 250-ml beaker. Add 2 ml of stabilizer solution and 50 ml of water. Measure *pH* of the solution by the *pH*-meter and adjust the *pH* between 5.5 and 2.5 by slowly adding hydrochloric acid. Stir the solution and allow to stand for 15 minutes. Then add sodium hydroxide solution from a burette, with constant stirring, until the *pH* is 7.5. Add 4 g of mannitol and stir well. The *pH* falls. Again add a known volume of sodium hydroxide solution from a burette to restore the *pH* value of the solution to 7.5. From this value, calculate the strength of sodium hydroxide solution using the following formula:

$$N = \frac{0.081 \times B}{T}$$

where

*N* = normality of sodium hydroxide solution,

*B* = mass in g of boric acid in one litre of boric acid solution, and

*T* = volume in ml of sodium hydroxide solution added to restore the *pH* of the solution to 7.5.

**5.2 Estimation of Boric Acid** -- Weigh about 10 g of latex to the nearest 0.1 g in a 250-ml beaker. Add 2 ml of stabilizer solution and 50 ml of water. Dip the electrodes of *pH* meter into the solution and add dilute hydrochloric acid drop-wise, with constant stirring till the *pH* is between 5.5 and 2.5. Stir and allow to stand for 15 minutes. Then add sodium hydroxide solution, with constant stirring so as to bring the solution *pH* to 7.5. Add 4 g of mannitol and stir well. The *pH* falls. Again add sodium hydroxide solution and note the volume of sodium hydroxide solution required to restore the *pH* to 7.5.

## 6. CALCULATION

**6.1** Calculate the percentage of boric acid ( $H_3BO_3$ ) in the latex as follows:

$$\text{Boric acid ( } H_3BO_3 \text{ ), percent by mass} = \frac{6.184 \times N \times V}{M}$$

where

*N* = normality of sodium hydroxide solution,

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$V$  = volume in ml of sodium hydroxide solution added to restore the pH to 7.5, and

$M$  = mass in g of test portion of the latex.

Results of duplicate determinations shall agree within 0.01 unit.

NOTE — If the solutions are not of the exact normality stated, appropriate correction factors shall be used in the calculations.

# APPENDIX A

( Clause 0.4.1 )

**TABLE SHOWING CORRESPONDENCE OF VARIOUS METHODS OF TEST COVERED IN THE EXISTING IS : 9316 ( PARTS 1 TO 5 )-1979, IS : 9316 ( PART 6 )-1982, IS : 3708 ( PART 1 )-1966, IS : 3708 ( PART 2 )-1968, IS : 4511 ( PART 1 )-1967, WITH THE REVISION/PROPOSED REVISION OF IS : 9316, IS : 3708 AND IS : 4511**

EXISTING TEST METHODS			PROPOSED REVISION		REMARKS
Test Method	IS No.	Part ( Series )	IS No.	Series	
(1)	(2)	(3)	(4)	(5)	(6)
<i>RL SERIES</i>					
∞ Determination of surface tension	IS : 9316-1979	Part 1	IS : 9316	Part 1 ( RL : 1 )	Under Revision
Determination of viscosity	IS : 9316-1979	Part 2	IS : 9316	Part 2 ( RL : 2 )	
Determination of coagulum content	IS : 9316-1979	Part 3	IS : 9316	Part 3 ( RL : 3 )	
Determination of total solids content	IS : 9316-1979	Part 4	IS : 9316	Part 4 ( RL : 4 )	
Drawing of samples	IS : 9316-1979	Part 5	IS : 9316	Part 5 ( RL : 5 )	
Determination of pH	IS : 9316-1982	Part 6	IS : 9316	Part 6 ( RL : 6 )	
Determination of total copper	IS : 3708-1966	Part 1 ( NRL : 13 )	IS : 9316	Part 7 ( RL : 7 )	
Determination of total iron	IS : 3708-1966	Part 1 ( NRL : 14 )	IS : 9316	Part 8 ( RL : 8 )	
Determination of total manganese	IS : 3708-1966	Part 1 ( NRL : 15 )	IS : 9316	Part 9 ( RL : 9 )	

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*NRL SERIES*

Determination of dry rubber content	IS : 3708-1966	Part 1 ( NRL : 1 )	IS : 3708-1985 Part 1 ( NRL : 1 )
Determination of sludge content	IS : 3708-1966	Part 1 ( NRL : 5 )	IS : 3708-1985 Part 2 ( NRL : 5 )
Determination of density	IS : 3708-1966	Part 1 ( NRL : 6 )	IS : 3708-1985 Part 3 ( NRL : 6 )
Determination of total alkalinity	IS : 3708-1966	Part 1 ( NRL : 7 )	IS : 3708-1985 Part 4 ( NRL : 7 )
Determination of KOH-number	IS : 3708-1966	Part 1 ( NRL : 8 )	IS : 3708-1985 Part 5 ( NRL : 8 )
Determination of mechanical stability	IS : 3708-1966	Part 1 ( NRL : 9 )	IS : 3708-1985 Part 6 ( NRL : 9 )
Determination of volatile fatty acid number	IS : 3708-1966	Part 1 ( NRL : 10 )	IS : 3708-1985 Part 7 ( NRL : 10 )
Determination of total nitrogen	IS : 3708-1966	Part 1 ( NRL : 12 )	IS : 3708-1985 Part 8 ( NRL : 12 )
Determination of total ash	IS : 3708-1966	Part 1 ( NRL : 16 )	IS : 3708-1985 Part 9 ( NRL : 16 )
Determination of boric acid	IS : 3708-1968	Part 2 ( NRL : 17 )	IS : 3708 Part 10 ( NRL : 17 )
Determination of magnesium	IS : 3708-1968	Part 2 ( NRL : 18 )	IS : 3708 Part 11 ( NRL : 18 )

EXISTING TEST METHODS			PROPOSED REVISION		REMARKS
Test Method	IS No.	Part ( Series )	IS No.	Series	
(1)	(2)	(3)	(4)	(5)	(6)
<i>SBRL SERIES</i>					
Determination of dry polymer	IS : 4511-1967	Part 1 ( SBRL : 1 )	IS : 4511	Part 1 ( SBRL : 1 )	
Determination of density	IS : 4511-1967	Part 1 ( SBRL : 6 )	IS : 4511	Part 2 ( SBRL : 6 )	
Determination of residual styrene ( volatile unsaturates )	IS : 4511-1967	Part 1 ( SBRL : 8 )	IS : 4511	Part 3 ( SBRL : 8 )	Under Revision
Determination of bound styrene	IS : 4511-1967	Part 1 ( SBRL : 9 )	IS : 4511	Part 4 ( SBRL : 9 )	
Determination of soap content	IS : 4511-1967	Part 1 ( SBRL : 10 )	IS : 4511	Part 5 ( SBRL : 10 )	Under Revision

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